# **Statement of Basis**

Title V Air Quality Permit Renewal

GOD THE PEOP

Missouri Basin Municipal Power Agency

**A Division Of** 

**Missouri River Energy Services** 

and the

Western Minnesota Municipal Power Agency

Watertown, South Dakota

South Dakota Department of Environment and Natural Resources

## TABLE OF CONTENTS

		Page
1.0	BAC	KGROUND1
2.0	OPE	RATIONAL DESCRIPTION1
3.0	EMI	SSION FACTORS2
	3.1	Emission Factors – Distillate Fuel
	3.2	Emission Factors – Natural Gas
	3.3	Tanks2
	3.4	Potential Emission Estimates2
	3.5	Tank Emissions
	3.6	Summary of Potential Emissions
4.0	PER	MIT REQUIREMENTS3
	4.1	New Source Review3
	4.2	Prevention of Significant Deterioration3
	4.3	New Source Performance Standards4
		4.3.1 ARSD 74:36:07:05 – 40 CFR, Part 60, Subpart K 4
		4.3.2 ARSD 74:36:07:18 – 40 CFR, Part 60, Subpart GG 5
	4.4	National Emission Standards for Hazardous Air Pollutants 5
	4.5	Maximum Achievable Control Technology 5
	4.6	Acid Rain Program6
	4.7	State Requirements6
		4.7.1 State Emission Limits
		4.7.2 Performance Tests
		4.7.3 Compliance Assurance Monitoring 8
		4.7.4 Periodic Monitoring 8
	4.8	Title V Permit8
	4.9	Air Fees9
	4.10	Summary of Applicable Requirements9
5.0	REC	COMMENDATION9

## 1.0 BACKGROUND

Western Minnesota Municipal Power Agency, which owns the Watertown plant, is a municipal corporation and political subdivision of the State of Minnesota. The Western Minnesota Municipal Power Agency membership consists of 23 municipalities in the state of Minnesota, 21 of which are also members of Missouri River Energy Services. Missouri River Energy Services serves 55 communities in Iowa, Minnesota, North Dakota and South Dakota. Missouri Basin Municipal Power Agency d.b.a. Missouri River Energy Services, which operates the plant, is a body corporate and politic organized under the laws of the States of Iowa, Minnesota, North Dakota and South Dakota whose members own and operate municipal utilities for the local distribution of electricity. Missouri Basin Municipal Power Agency was formed in the early 1960's and the name was changed to Missouri River Energy Services in 1998.

On August 27, 1998, Missouri Basin Municipal Power Agency was issued a Title V air quality operating permit (Permit #28.0801-05) to operate a Turbo dyne/BBC simple-cycle combustion turbine. Table 1.1 lists the permitted equipment from the existing permit.

Table 1.1 – Description of Permitted Units, Operations, and Processes

			Maximum	Control
Uni	it	Description	Operating Rate	Device
#1	-	1977 Turbodyne/BBC simple-	770 million Btus per hour	Not applicable
		cycle combustion turbine, model	heat input (distillate oil)	
		no. 11D-4A, fired with distillate	809 million Btus per hour	
		oil and natural gas.	heat input (natural gas)	

Missouri Basin Municipal Power Agency d.b.a. Missouri River Energy Services (Missouri Basin) submitted an application to renew the Title V air quality operating permit for the Watertown facility on December 16, 2010. The application was determined to be complete on January 4, 2011.

Missouri Basin also operates two 150,000 gallon aboveground storage tanks used for the storage of #2 fuel oil for the combustion turbine. These tanks have not been previously reviewed and will be included in this review.

#### 2.0 OPERATIONAL DESCRIPTION

Missouri Basin operates an electrical power generation plant in Watertown, South Dakota for the Western Minnesota Municipal Power Agency. The plant utilizes a Turbodyne/BBC simple-cycle combustion turbine for electrical production.

### 3.0 EMISSION FACTORS

#### 3.1 Emission Factors – Distillate Fuel

The emission rates in Table 3.1 for a combustion turbine are derived from EPA's Compilation of Air Pollutant Emission Factors, also known as AP-42, Fifth Edition, Tables 3.1-1, 3.1-2a, 3.1-4 and 3.1-5, 4/00. The sulfur dioxide emission rate is based on the typical sulfur content of no. 2 distillate oil of less than or equal to 0.05 percent sulfur by weight.

Table 3.1 – Uncontrolled Emission Factors for Distillate-Fired Combustion Turbines

Pollutant	TSP	PM10	SO <sub>2</sub>	NO <sub>x</sub>	CO	VOCs	HAPs
Distillate Oil	1.2 x 10 <sup>-2</sup>	$4.3 \times 10^{-3}$	5.05 x 10 <sup>-2 a</sup>	0.88	$3.3 \times 10^{-3}$	4.1 x10 <sup>-4</sup>	1.29 x 10 <sup>-3</sup>
(lbs/MMBtu)							

 $<sup>^{</sup>a}$  – "S<sub>1</sub>" in the formula for sulfur dioxide (SO<sub>2</sub>) = 1.01 x S<sub>1</sub> pounds per MMBtu is the weight % of sulfur in the oil. WMMPA's application stated the sulfur content was less than or equal to 500 ppm (0.05%). Substituting 0.05% for "S<sub>1</sub>" in the formula equates to a sulfur dioxide emission rate of 0.0505 pounds per MMBtu.

#### 3.2 Emission Factors – Natural Gas

The following emission rates are derived from EPA's Compilation of Air Pollutant Emission Factors, also known as AP-42, Fifth Edition, Tables 3.1-1, 3.1-2a, 3.1-4 and 3.1-5. The sulfur dioxide emission rate is calculated assuming that the sulfur content of the natural gas is 0.0034 weight percent. The HAP emission factors for natural gas-fired combustion turbines are listed in Table 3.2.

Table 3.2 – Uncontrolled Emission Factors for Natural Gas-Fired Combustion Turbines

Pollutant	TSP	PM10	$SO_2$	$NO_x$	CO	VOCs	HAPs
Natural Gas	6.6 x 10 <sup>-3</sup>	1.9 x 10 <sup>-3</sup>	$3.4 \times 10^{-3}$ a	0.32	$8.2 \times 10^{-2}$	$2.1 \times 10^{-3}$	$1.03 \times 10^{-3}$
(lbs/MMBtu)							

 $<sup>^{</sup>a}$  – "S" in the formula for sulfur dioxide (SO<sub>2</sub>) = 0.94 x S<sub>1</sub> pounds per MMBtu is the weight % of sulfur in the natural gas. If the sulfur content is unknown, then AP-42 states a SO<sub>2</sub> emission factor of 0.0034 lbs/MMBtu can be used.

#### 3.3 Tanks

The emissions factors for the tanks will not be necessary as the TANKS program will be used to calculate the potential emissions from the tank.

### **3.4 Potential Emission Estimates**

The potential emissions are calculated assuming the combustion turbine operates 24 hours a day, 365 days per year (8,760 hours per year), utilizing no. 2 fuel oil or natural gas. Potential uncontrolled emissions are those that would occur with no emission controls.

There is no control equipment associated with the combustion turbine. Therefore, the potential uncontrolled emissions are equal to the potential controlled emissions and will be referred to as potential emissions. Equation 3-1 will be used to calculate potential emissions.

## Equation 3-1 – Potential emission calculations

$$Potential \ Emissions = Heat \ Input \frac{MMBtus}{hour} \times Emission \ Factor \frac{pounds}{MMBtu} \times 8,760 \frac{hours}{year} \times \frac{ton}{2,000 pounds}$$

The potential emissions were calculated for both no. 2 fuel oil and natural gas and the fuel that produced the greatest potential emissions is displayed on Table 3.3.

#### 3.5 Tank Emissions

The TANKS 4.0.9 Program results in Appendix A indicate the tank has the potential to generate 100 pounds per year or 0.2 tons per year of volatile organic compounds.

### 3.6 Summary of Potential Emissions

Table 3.3 – Annual Potential Emissions (tons per year)

Unit	TSP	PM10	$SO_2$	$NO_X$	VOCs	Total HAPs	CO
#1	41	15	170	2,968	11	4	291
Tank #1					0.1		
Tank #2					0.1		
Total	41	15	170	2,968	11	4	291

## 4.0 PERMIT REQUIREMENTS

#### 4.1 New Source Review

The Administrative Rules of South Dakota (ARSD) 74:36:10:01 states New Source Review regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. Missouri Basin's Watertown facility is located in Codington County, South Dakota, which is in attainment or unclassifiable for all the pollutants regulated under the Clean Air Act. Therefore, Missouri Basin's Watertown facility is not subject to New Source Review.

### **4.2** Prevention of Significant Deterioration

The potential emissions of, nitrogen oxide and carbon monoxide are greater than the major source threshold under the Prevention of Significant Deterioration (PSD) program. However, Missouri Basin commenced construction prior to the implementation of the PSD program and the existing equipment is not required to meet the PSD requirements.

On September 13, 1991, Missouri Basin sent a letter to the Environmental Protection Agency requesting verification the start-up of the plant was indeed a reactivation and, therefore, not subject to PSD. The Environmental Protection Agency responded in agreement on October 29, 1991. They agreed that the facility had been in a temporary shutdown and, therefore, not required to meet PSD.

Future changes to the facility will need to be reviewed to determine if they would be considered a major modification and subject to a PSD review and permit.

#### 4.3 New Source Performance Standards

## 4.3.1 ARSD 74:36:07:05 – 40 CFR, Part 60, Subpart K

DENR reviewed the New Source Performance Standards and determined 40 CFR, Part 60, Subpart K may be applicable to the processes at Missouri Basin's Watertown facility. Subpart K is applicable to each storage vessel for which:

- 1. Construction, reconstruction, or modification commenced after June 11, 1973 and before May 19, 1978; and
- 2. The tank has a capacity greater than or equal to 151,412 liters (40,000 gallons) that is used to store petroleum liquids.

The two 150,000 gallon aboveground storage tanks were constructed in 1977. Because the storage capacity is greater than 40,000 gallons, this subpart is applicable to the storage tank. Missouri Basin is storing distillate oil in the tanks, which has a maximum true vapor pressure of 0.0065 pounds per square inch absolute (0.045 kilopascals). Therefore, the tanks are not subject to the standards for volatile organic compounds (40 CFR § 60.112) and the monitoring of operations (40 CFR § 60.113). Even though the tanks are applicable to the standard, Missouri Basin does not have to meet any of the requirements provided the type of petroleum stored in the tanks maintains a maximum true vapor pressure less than 1.0 pounds per square inch absolute (0.69 kilopascals).

In accordance with 40 CFR § 60.111(b) a petroleum liquid means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery but does not mean Nos. 2 through 6 fuel oils as specified in ASTM D396–78, 89, 90, 92, 96, or 98, gas turbine fuel oils Nos. 2–GT through 4–GT as specified in ASTM D2880–78 or 96, or diesel fuel oils Nos. 2–D and 4–D as specified in ASTM D975–78, 96, or 98a.

Missouri Basin stores what is classified as diesel fuel No. 2 in the tanks. Therefore, Missouri Basin is required to notify the department and modify the permit if it plans on changing the type of petroleum product stored in the tank.

## 4.3.2 ARSD 74:36:07:18 – 40 CFR, Part 60, Subpart GG

DENR reviewed the New Source Performance Standards and determined 40 CFR Part 60, Subpart GG – Standards of Performance for Stationary Gas Turbines may be applicable to the processes at Missouri Basin's Watertown Plant. The provisions of this subpart are applicable to all stationary gas turbines with a heat input at peak load equal to or greater than 10.7 giga Joules per hour and commenced construction or modification after October 3, 1977.

Equation 4-1 will be used to convert the gas turbines heat input of 809 million Btus per hour to giga Joules per hour. The maximum design peak heat input of the gas turbine is 853 giga Joules per hour.

## Equation 4-1 – Conversion to giga Joules per hour

$$809 \frac{MMBtu}{hr} \times 1,054.2 \frac{Joules}{Btu} \times 10^{6} \frac{Btu}{MMBtu} \times \frac{1giga\ Joules}{10^{9}\ Joules} = 853 \frac{giga\ Joules}{hour}$$

Although the maximum design peak heat input is greater than 10.7 giga Joules per hour, Missouri Basin began construction of the stationary gas turbine before October 3, 1977. Therefore, the stationary gas turbine does not fall under the New Source Performance Standards for Stationary Gas Turbines.

#### 4.4 National Emission Standards for Hazardous Air Pollutants

Presently, there are no finalized or promulgated National Emissions Standards for Hazardous Air Pollutants standards under 40 CFR Part 61 applicable to this type of operation.

### 4.5 Maximum Achievable Control Technology

DENR reviewed 40 CFR Part 63 Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines and determined it may be applicable to the processes at Missouri Basin's Watertown Plant. Subpart YYYY is applicable if the stationary combustion turbine is located at a major source of hazardous air pollutant (HAP) emissions. A stationary combustion turbine is existing if construction or reconstruction of the stationary combustion turbine occurred on or before January 14, 2003. The combustion turbine was constructed prior to January 14, 2003. A major source of HAP emissions is a contiguous site under common control that emits or has the potential to emit any single HAP at a rate of 10 tons or more per year or any combination of HAP at a rate of 25 tons or more per year. Missouri Basin's Watertown combustion turbine emits less than 10 tons per year of any individual HAP and less than 25 tons per year of any combination of HAPs and is not considered a major source of HAPs.

Missouri Basin's Watertown combustion turbine is not located at a major source of hazardous air pollutants and was constructed prior to the applicable date; therefore, it is not subject to Subpart YYYY.

## 4.6 Acid Rain Program

A facility is exempt from the Acid Rain Program under 40 CFR § 75.2(b)(2) as referenced to 40 CFR § 72.6(b) if it meets the following requirements:

- 1. A simple combustion turbine that commenced operation before November 15, 1990; or
- 2. Any unit that commenced commercial operation before November 15, 1990, and did not, as of November 15, 1990 and does not currently, serve a generator with a nameplate capacity greater than 25 megawatts.

The combustion turbine was in operation prior to November 15, 1990, and the unit does not serve a generator with a nameplate capacity greater than 25 megawatts. Missouri Basin meets the requirements for the exemption under the Acid Rain Program.

## 4.7 State Requirements

Based on the potential emission calculations, Missouri Basin's Watertown combustion turbine plant is considered a major source and meets the requirements for a Title V air quality permit. A major source is defined in ARSD 74:36:01:08 as any source with the potential to emit 100 tons per year of a criteria pollutant (e.g., particulate, sulfur dioxide, nitrogen oxides, volatile organic compounds, or carbon monoxide). Missouri Basin's potential sulfur dioxide, nitrogen oxides and carbon monoxide emissions are greater than the major source threshold.

#### **4.7.1 State Emission Limits**

Total suspended particulate and sulfur dioxide emission limits are applicable to both processes and fuel burning units. Missouri Bain's operations only involve fuel burning units. The total suspended particulate and sulfur dioxide emission limit for fuel burning units is derived from ARSD 74:36:06:02.

The maximum heat input value for Unit #1 is greater than 10 million Btus per hour. Equation 4-2, derived from ARSD 74:36:06:02(1)(b), is used to calculate the state's total suspended particulate emission limit for fuel burning units with a heat input capacity greater than 10 million Btus per hour.

Equation 4-2 – State total suspended particulate emission limit

$$E_{TSP} \frac{lbs}{MMBtu} = 0.811 \times H^{-0.131}$$

Where H is the heat input capacity, in units of million Btus per hour.

Using Equation 4-2 and the maximum heat input value of Unit #1 (809 million Btus per hour), the total suspended particulate emission limit for Unit #1 is 0.34 pounds per million Btus heat input.

In accordance with ARSD 74:36:06:02(2), the sulfur dioxide emission limit for a fuel burning unit is 3.0 pounds per million Btus heat input.

Tables 4.1 and 4.2 compare the applicable state total suspended particulate and sulfur dioxide limits with the potential total suspended particulate and sulfur dioxide emission rates for Unit #1, respectively.

**Table 4.1** – Total Suspended Particulate Limit Comparison

	Total Suspended	l Particulate <sup>1</sup>	
Unit	Potential Emission Rate	Emission Limit	
#1	0.012 pounds/MMBtus	0.34 pounds/MMBtus	

<sup>&</sup>lt;sup>1</sup> – Potential emission rate and limit based on heat input.

Table 4.2 – Sulfur Dioxide Limit Comparison

	Sulfur Dioxide <sup>1</sup>			
Unit	Potential Emission Rate	Emission Limit		
#1	0.051 pounds/MMBtus	3.00 pounds/MMBtus		

<sup>&</sup>lt;sup>1</sup> – Potential emission rate and limit based on heat input.

In addition to the total suspended particulate and sulfur dioxide emission limit, Unit #1 is also required to meet an opacity limit of 20 percent in accordance with ARSD 74:36:12:01.

Based on the comparison in Table 4.1 and 4.2, the use of no. 2 fuel oil and natural gas as a fuel, Missouri Basin's operation is capable of operating in compliance with the state air emission limits.

## **4.7.2** Performance Tests

In accordance with ARSD 74:36:11:02, the Secretary may require a stack performance test if necessary to demonstrate compliance with the state's emission limits. Typically a facility is required to conduct a stack performance test to demonstrate compliance with the state's particulate matter emission limit and a sulfur analysis of the fuel to demonstrate compliance with the state's sulfur dioxide emission limit. At this time, DENR does not believe a stack performance test is warranted. However, permit conditions will be included in the draft permit that will allow DENR to require a stack performance test if DENR believes a stack performance test in necessary in the future to demonstrate compliance.

### 4.7.3 Compliance Assurance Monitoring

Compliance assurance monitoring is applicable to permit applications received on or after April 20, 1998, from sources applying for a Title V air quality permit. Missouri Basin's renewal application was received on January 4, 2011. Therefore, compliance assurance monitoring is applicable to any unit that meets the following criteria:

- 1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;
- 2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
- 3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

Missouri Basin's Watertown combustion turbine does not use a control device to achieve compliance with applicable requirements. Therefore, compliance assurance monitoring is not applicable to Missouri Basin.

## 4.7.4 Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to Title V of the federal Clean Air Act. The combustion turbine is subject to opacity, particulate, and sulfur dioxide emission limits.

Compliance with the opacity and particulate emission limits will be based on periodic visible emission readings. The Watertown combustion turbine plant is operated only during peak or emergency conditions. Therefore, Missouri Basin will only be required to conduct a visible emission observation once per year.

Compliance with the sulfur dioxide emission limits will be based on the sulfur content of the distillate oil. If a fuel supplier's certificate is not obtained, the facility will be required to test the sulfur content of the distillate oil in the storage tank after each shipment has been unloaded.

#### 4.8 Title V Permit

Any source operating in South Dakota that meets the requirements of the ARSD 74:36:05:03 are required to obtain a Part 70 permit. A Title V permit is required if a source has the potential to emit more than 100 tons of a criteria pollutant, has the potential to emit more than 10 tons of a single hazardous air pollutant, has the potential to emit more than 25 tons of any combination of a hazardous air pollutants, is applicable to a New Source Performance Standard or applicable to a Maximum Achievable Control Technology Standard. Missouri Basin has the potential to emit greater than 100 tons per year of nitrogen oxides, sulfur dioxide and carbon monoxide. The two storage tanks are subject to New Source Performance Standards. Therefore, Missouri Basin is

required to have a Title V air quality permit for the operations at this facility. Table 5.2 lists the permitted units for this facility.

Table 5.2 – Description of Permitted Units, Operations, and Processes

		Maximum	Control
Unit	Description	Operating Rate	Device
#1	1977 Turbodyne/BBC simple-cycle	770 million Btus	Not applicable
	combustion turbine, model no. 11D-4A,	per hour heat input	
	fired with distillate oil and natural gas.	(distillate oil)	
		809 million Btus	
		per hour heat input	
		(natural gas)	
#2	Tank #1 – Aboveground petroleum storage	150,000 gallons	Not applicable
	tank. Currently stores distillate oil.		
#3	Tank #2 – Aboveground petroleum storage	150,000 gallons	Not applicable
	tank. Currently stores distillate oil.		

#### 4.9 Air Fees

Title V sources are subject to an annual air quality fee. The fee consists of an administrative fee and a per ton fee based on the actual tons per year of pollutant emitted. The pollutants that are charged for include particulate matter, sulfur dioxides, nitrogen oxides, volatile organic compounds, and hazardous air pollutants.

#### 4.10 Summary of Applicable Requirements

Missouri Basin will be required to operate within the requirements stipulated in the following regulations:

- 1. ARSD 74:36:05 Operating Permits for Part 70 Sources;
- 2. ARSD 74:36:06 Regulated Air Pollutant Emissions;
- 3. ARSD 74:36:11 Performance Testing;
- 4. ARSD 74:36:12 Control of Visible Emissions: and
- 5. ARSD 74:37:01 Air Pollution Control Program Fees.

## 5.0 RECOMMENDATION

Based on the information submitted in the air quality permit renewal application, the department recommends conditional approval of a Title V air quality permit. Questions regarding this permit review should be directed to Keith Gestring, Natural Resources Engineer.